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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,672	02/11/2004	Elizabeth G. Pavel	7608	3482

55649 7590 03/09/2006

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EXAMINER
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TRAN, BINH X

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 03/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/776,672	PAVEL ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Binh X. Tran	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7, 9, 10, 13-22 and 24-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-10, 13-22, 24-26 is/are rejected.
- 7) ☒ Claim(s) 27-30 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 3-5, 7, 9-10, 15-16, 18-22, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishihara (US 2001/0027023 A1).

Respect to claims 1 and 16, Ishihara discloses a method for removing/etching photoresist layer (organic layer, paragraph 0116) comprising the step of:

position the substrate comprising a photoresist layer into a processing chamber  
(See Fig 1);

removing the photoresist layer using a plasma (paragraph 0119-0135);

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monitoring the plasma for hydrogen optical emission, CO optical emission, oxygen optical emission during the process (paragraph 0135-0136).

terminate the removing process according to the intensity result of emission peak wavelength of oxygen, hydrogen (paragraph 0135-136, read on "stopping the etching upon either the hydrogen optical emission obtaining a first level or the oxygen optical emission obtaining a second level, or both").

Ishihara does not explicitly disclose monitoring the plasma for both hydrogen and oxygen optical emission. However, Ishihara clearly measure the intensity of light emission of hydrogen, oxygen, CO, or the like (paragraph 136). In paragraph 135, Ishihara discloses the monitoring the emission of CO and hydrogen, or oxygen (O) and using the information from the monitoring to control the switching time. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Ishihara by monitoring both hydrogen and oxygen emission because this will result in a more accurate endpoint. Further, Ishihara clearly disclose it is possible to monitor plurality of emission at the same time in order to control the endpoint (i.e. switching time).

Respect to claims 3 and 18-19, Ishihara teaches the photoresist layer is implanted with arsenic (As), phosphorous (P), or boron (B) (paragraph 0016). Respect to claims 4 and 20, Ishihara teaches the photoresist has been exposed to ions or ion beam (paragraph 0116).

Respect to claims 5, Ishihara does not explicitly disclose the photoresist has been exposed to an electron beam. However, Ishihara clearly teach to expose the

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photoresist layer to the plasma. The online dictionary defines plasma as "*An electrically neutral, highly ionized gas composed of ions, electrons, and neutral particles. It is a phase of matter distinct from solids, liquids, and normal gases*" (See prior art of record in previous office action). Therefore, the examiner interprets Ishihara teaches to expose photoresist layer to electron beam.

Respect to claims 7 and 21, Ishihara teaches the hydrogen optical emission occurs at a wavelength of about 656 nm (paragraph 0136). Respect to claims 9 and 22, Ishihara discloses the oxygen optical emission occurs at a wavelength of about 777 nm (paragraph 0136). Respect to claim 10, Ishihara discloses stopping the etching upon the hydrogen optical emission obtaining a predetermined level (paragraph 135-136)

Respect to claims 15 and 26, Ishihara discloses the emission peak of hydrogen and emission peak of oxygen depend on hydrogen atoms and oxygen atoms. The concentration of hydrogen and oxygen atoms is depended on the input flow rate for each individual gas with respect to each other. Since the flow rate of hydrogen can be correlated with the flow rate of oxygen. Therefore, the hydrogen optical emission must be correlated with the oxygen optical emission.

4. Claims 2, 6, 13-14, 17, 24-25 rejected under 35 U.S.C. 103(a) as being unpatentable over Ishihara in view of Hallock et al. (US 2002/0151156).

Respect to claims 2 and 17, Ishihara fails to disclose the photoresist layer comprises a harden crust layer. However, Ishihara clearly teaches to implant ion such as boron, phosphorous, arsenic into the photoresist layer. Hallock teaches implant boron, phosphorous or arsenic ion to form a harden crust layer (paragraph 0018). It

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would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Ishihara in view of Hallock by having a harden crust layer because it will prevent ion form penetrating into the surface of the substrate.

Respect to claims 6, 13-14, Hallock discloses the optical emission having first level during etching and second level after the crust is removed and third after the photoresist is removed (Fig 2-3). Respect to claims 24-25, Hallock discloses that a single optical emission signal having at least three of level (first, second and third). Ishihara teaches to monitor two different optical emission signals. Two optical emission signals should have at least 6 different levels (i.e.  $2 \times 3 = 6$ ).

#### ***Allowable Subject Matter***

5. Claims 27-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose or suggest the following step in conjunction with all other limitations in the claim: determining form at least one of the monitored optical emissions whether a cleaning cycle is necessary, whether components with the chamber are degrading, or both.

#### ***Response to Arguments***

7. The applicant's amendment is sufficient to overcome the 35 USC 112 rejections. Thus, the examiner withdraws the previous 35 USC 112 rejections in this office action.

Applicant's arguments filed 12-27-2005 with respect to the 35 USC 102(e) rejections have been fully considered and persuasive. Thus, the examiner withdraws the 35 USC 102(b) rejections. However, upon further consideration, the examiner provides a new 35 USC 103(a) rejections as discussed above.

The applicant argues that that in paragraph 136, Ishihara recites "measure the intensity of light at the emission peak wavelength of hydrogen atoms of 656 nm, the emission peak of wavelength of oxygen atoms of 777 nm, the emission peak wavelength of CO of 309 nm, or the like". According to applicant, "as such, Ishihara fails to teach or suggest monitoring the plasma for both a hydrogen optical emission and oxygen optical emission". The examiner disagrees. The term "or the like" does not necessary imply to measure the intensity for only one optical emission. On the contrary, in paragraphs 135, Ishihara clearly teaches to monitor the plurality of light emission including CO and H (hydrogen), or O (oxygen). Thus, the examiner considers that it is obvious to monitor both oxygen emission and hydrogen emission since Ishihara explicitly disclosing the wavelength for both oxygen and hydrogen (in paragraph 136), as well as the teaching monitoring the plurality of optical emissions in paragraph 135.

### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh Tran

Binh X. Tran